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SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

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BIOTECHNOLOGY

GENETIC ENGINEERS PRODUCE SURFACE PROTEIN OF RABIES VIRUS

Paris LES ECHOS in French 5 Aug 82 p 7

[Article: "Revolution in the Struggle Against Rabies: A French Vaccine by Genetic Engineering"]

If anyone is accusing French industry of being "underdeveloped" in the field of genetic engineering, the much-discussed biotechnology, the Transgene company provides a resounding denial. Indeed, its laboratories in Strasbourg have succeeded in producing rabies virus surface protein by genetic recombination.

In scientific terms, they have succeeded in getting a microorganism to express the glycoprotein of the virus responsible for this dread disease. This spectacular breakthrough by French researchers has its origins in the isolation of the gene for this glycoprotein by the Wistar Institute of Philadelphia.

Transgene, founded in 1980, is a French company specializing in genetic engineering. Its research programs, being carried out by some 40 specialists, are aimed at industrial applications in fields such as pharmaceuticals, fine chemicals, and the agro-food industry. As early as last April the company announced that its laboratory had succeeded in cloning the gene for gamma interferon, work done on behalf of Roussel-UCLAF.

The artificial synthesis of the surface protein of the rabies virus is a world first, which appears to have enormous practical implications. Moreover, to proceed to the development stage, Transgene has now concluded a research agreement with the Merieux Institute calling for production of rabies glycoprotein by genetic engineering and research on its immunological properties, to make possible the industrial development of an anti-rabies vaccine.

The Merieux Institute, a subsidiary of the Rhone-Poulenc group, holds a position among the leaders in industrial biology and particularly in the field of vaccines.

500,000 Immunized Each Year

Immunication against rabies is not a new procedure. It is estimated that 500,000 persons are immunized each year in the world, including some 30,000 in the United States and several thousand in France.

Genetic engineering, however, offers the possibility of appreciably lowering the cost of immunization. Up to now, the high cost of traditional vaccines has meant that even in developed countries the use of immunization as a preventative measure is relatively low.

With the technique of genetic engineering, it is possible to consider an entirely different strategy. Instead of cultivating the virus itself using very elaborate culture procedures and then inactivating the virus, genetic engineering makes it possible to avoid working with the virus and instead work only with the glycoprotein. This glycoprotein fraction on one hand has the property of being the carrier of antigenic sites and on the other hand is not capable of independent propagation.

Therefore, by producing and using the rabies glycoprotein, immune protection can be obtained without the slightest risk of contagion at any stage during manufacture or use.

Transgene is now entering a new stage: On one hand, with the help of Merieux, the company is trying to achieve industrial manufacture of the glycoprotein by microorganisms or in cell culture; on the other hand, it would like to determine more precisely what portion of the glycoprotein constitutes the antigenic site or sites.

Biotechnology: Investments

Elsewhere, biotechnology is now being heavily developed both in the English-speaking countries and in Japan. Accordingly, it has been learned that W. R. Grace & Co., a large American conglomerate with interests primarily in chemistry, plans an investment of $50 million over the next 5 years to intensify its research in the biotechnology field. It intends to make acquisitions in this field, but of course is not revealing what companies may be targeted for takeover. In another move, Grace has signed a contract with MIT (Massachusetts Institute of Technology) for scientific collaboration in the field of microbiology, involving a planned expenditure of $8.5 million.

In Great Britain, on the other hand, John Brown Engineers & Constructors and the Dalgety-Spillers, Galahers, and Whitbread firms have recently decided to invest 1 million pounds sterling to share in research carried out by a biotechnology research laboratory founded by the University of Leicester. The university has allocated 183,000 pounds to equip the laboratory, which will become a full-fledged biochemistry center.

The programs will include work on the genetic transformation of microorganisms for the agro-food industry and for the development of new products such as medications and enzymes.

Finally, in Japan, MITI (Ministry of International Trade and Industry) is presently carrying out a 7-year plan to develop biomass technologies and has launched a 10-year plan calling for spending 26 billion yen for the development of biotechnologies, while very substantial investments are also being made by the private sector.

9828
CSO: 3102/414

BIOTECHNOLOGY

HOECHST STEPS UP PACE OF GENETIC, BIOTECHNOLOGY RESEARCH

Duesseldorf VDI NACHRICHTEN in German 4 Jun 82 p 24

[Article by Hartmut Welfert: "Hoechst Pushes Genetics and Biotechnology"]

> [Text] Hoechst AG, Frankfurt/Main-Hoechst, whose worldwide sales increased 15.1 percent to over DM 34.4 billion last year while it became the largest chemical company in the FRG, attributes its relatively favorable results in the face of worldwide economic stagnation to a considerable degree to the fact that, in the words of Board Chairman Prof Rolf Sammet, "Our broadly based research and development activity is bearing fruit." Of course, the "harvest" presupposes considerable investment in the "seeds": and thus Hoechst has invested DM 1.5 billion worldwide. That was even more than the targeted before-tax worldwide profit of just under DM 1.2 billion, which figure itself is lower by DM 352 million than in 1980.

In the long run, Hoechst is betting on genetics and biotechnology. Here one expects decisive impulses for the medicines of tomorrow and for agriculture and environmental protection. Since with the aid of genetic technology methods certain bacteria can be programmed to produce compounds not contained in their original genetic blueprint, in the future hormones, antibiotics and vaccines can probably be more economically produced in this manner. Intensification of this research is fostered by an agreement between Hoechst and Harvard University's Massachusetts General Hospital in Boston on joint efforts in genetic technology.

In biotechnology Hoechst is continuing its effort to produce natural substances such as protein, enzymes, nucleic acid and polysaccharide from microorganisms. Bioproteins, which could be produced from protein with the aid of enzymes, are of interest to the food-processing industry because of their emulsifying and foaming properties. An installation operation on the principle of the continuous fermentation process for bioalcohol developed by Hoechst will be built this year at Frankenzucker AG now that an initial demonstration facility has already been built by Uhde, the Hoechst subsidiary in Brazil.

Further centers of research interest at Hoechst lie, according to tradition, in the pharmaceuticals branch, which received DM 645 million; in plant protection; in the information technology unit operated by Kalle AG in Wiesbaden; in coal processing and in dyes and pigments.

It is hardly surprising that during the 1981 business year there were both bright and dark spots among the numerous branches of the Frankfurt chemical giant. While, for example, the fiber branch finally came again into the black after a long slump, earnings in dyes, pigments and paints have clearly got worse. The plastics business also fared very badly. Here there was a recurring drop in usage in Western Europe, amounting to about 10 percent and affecting mostly standard qualities. Technical plastics on the other hand were again in better demand. Also, medicines registered outstanding sales growth through real growth in quantity.

There were significant differences in domestic and export business. While domestic sales volume slipped by about 1 percent, export volume climbed by about 6 percent, resulting in an estimated sales gain of 4 percent for the company. From worldwide sales DM 9.5 (9.3) billion [all statistics given in parentheses are for 1980] was generated at home and DM 24.9 (20.7) billion abroad; and 13.3 (10) billion of the latter amount came from production facilities abroad.

Hoechst AG received DM 12.2 (11.2) billion from sales, logged a before-tax profit of DM 718 (905) million and an after-tax profit of DM 353 (364) million. From this the stockholders will again receive a divident of DM 7 for each DM 50 share. In addition they will vote on the creation of DM 300 million of authorized capital for the use of which, however, there are according to Sammet, "still no concrete plans."

The first quarter of 1982 has been rather disappointing. It is true that Hoechst AG sales have increased by 5.6 percent to DM 3.25 billion, but before-tax profits of DM 203 million remained 4.2 percent below those of the first quarter of 1981. Worldwide sales increased by 5.4 percent to DM 8.9 billion. The company, which employs almost 185,000 workers, looks toward the remainder of the year somewhat skeptically.

Worldwide Hoechst Sales by Business Area

Area	1980		1981		
	Million DM	Fraction Percent	Million DM	Fraction Percent	Change From Previous Year Percent
Pharmaceuticals	4,755	16	5,748	17	20.9
Paint and plastic resins	3,612	12	3,980	12	10.2
Plastics and waxes	2,885	10	3,202	9	11.0
Fibers and initial products	2,282	8	3,003	9	31.6
Inorganic chemicals	1,851	6	2,059	6	11.2
Agriculture	1,573	5	1,834	5	16.6

Dyes, pigments and initial products	1,426	5	1,626	5	14.0
Welding products and industrial gases	1,344	4	1,535	4	14.2
Organic chemicals	1,299	4	1,520	4	17.0
Foils	1,252	4	1,415	4	13.0
Surface active agents and associated products	1,106	4	1,256	4	13.6
Information technology	1,056	4	1,234	4	16.9
Facilities construction	731	2	803	2	9.8
Consumer products	561	2	717	2	27.8
Partner businesses	4,182	14	4,503	13	7.7

9160
CSO: 3102/399

BRIEFS

MICROELECTRONICS PROGRAM GOING WELL--Federal Research Minister Andreas von Buelow will beef up his ministry's program for the support of microelectronics. As the minister related recently in Bonn, DM 450 million will be made available for this program in the 1982-1984 period instead of the DM 300 million previously allocated. Von Buelow emphasized that microelectronics will be moved ahead decisively with these funds. The minister expressed his satisfaction with the quality of the projects submitted for support since January of this year. Industry's response was rapid, and the special program will presumably be booked up in July. Additional increases in funding are not to be expected in view of the tight budget. Von Buelow indicated that with the DM 450 million about 2,000 projects for applying microelectronics in new products could be aided; 1,800 requests have been made to date. [Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 2 Jun 82 p 1] 9160

CSO: 3102/437

ENERGY

NORTH GERMAN INVENTOR DESIGNS SHIPBOARD WIND TURBINES

Hamburg DER SPIEGEL in German 23 Aug 82 pp 79-80

[Article: "A Good Chance"]

[Text] With an original design, a North German inventor intends to prove that wind energy is cheap and producable in abundance.

Guenter Wagner, proprietor of a four-man business in the List community of Sylt intends to challenge the giants of the energy industry. With a wind-driven rotor at sea, Wagner first wants to supply the Frisian Island of Sylt with electricity and later even the state of Hamburg.

"Instead of atomics and coal," asserted the trained aerodynamicist, "wind energy can soon supply large areas along the coast." The aerodynamicist hit on a novel scheme for utilizing this form of energy.

Wagner, who came by some money from patents, bought a 30-meter-long, 70-year-old cutter. In the after part of the ship, he installed a used transmission in a canted position. On the transmission Wagner placed a 25-meter-long, almost horizontal working blade and a short upward-flapped stabilization blade.

Below in the stern of the ship, the perfectionist reinforced the transmission bearings with heavy iron supports, flanged on an electric generator and designated the whole thing as a floating wind power plant. The system, which was put together with about DM .5 million of his own money, worked from the start: Since the beginning of 1982, Wagner's floating wind turbine has been producing 250 kW (.250 MW) of electric power.

With his research ship, Wagner wants to convince engineers, economists, politicians and public officials by demonstration that simple designs can pay off big. Wagner sees in mounting the windwheel at ground level a distinct advantage compared to mounting wind-driven rotors on tall towers.

By scaling up his simple model, the man from List hopes to be able to open up large energy sources which are still blowing around unused. In this connection Wagner calculates that a blade 4 times as large on an 80-meter-long ship can

generate instead of 250 kW an amount equal to 7,000 kW (7 MW) which is about a third of the average electric power demand of Sylt. "And that," animatedly asserts the inventor, "is more than the Growian wind tower produces with a subsidy of DM 80 million--only it is cheaper."

Cheaper--Wagner believes he can assemble his power plant for DM 10 million--because "there is presently no shortage of idle ships." Accordingly, Wagner has in the meantime talked with the Hamburg ship owner Horst Bartels about consigning him his 1,285 grt motor ship "Neuwulmstorf." The ship is almost 90 meters long and will carry Wagner's next wind rotor with which, it is claimed, 7 MW of electric power can be generated.

The inventor and the ship owner will have the "Neuwulmstorf" refitted for the wind power plant at a shipyard, and starting next year it will transmit its electricity to Sylt via a 4-km-long underwater cable which will cost DM 600,000.

The targeted customer is the Schleswig-Holstein Electric Company AG (Schleswag) with which Wagner has already agreed by letter to discuss a long-term contract for the "acceptance of electricity from shipboard wind power plants."

At the Bonn Research Ministry, which purposely proceeds with caution in supporting small but often misdirected inventors, Wagner nonetheless received affirmation that certain measurements will be financed with public funds in the future. Also, Wagner would like money from Bonn in order to be able to report on his experimental power plant at a wind energy symposium in Stockholm.

Hamburg's Mayor Klaus von Dohnanyi, who wanted to prepare himself for talks with his new friends from the Green Alternative List, visited Wagner's experimental cutter during his recent Sylt stop.

Impressed, but somewhat at arm's length, Dohnanyi expressed interest in Wagner's wind machine because, in the mayor's opinion, Hamburg should become an energy center. "From this perspective," according to Dohnanyi on board, "this system is naturally a strong contender." According to Wagner's rough calculations, his wind power plant can be produced for DM 1,500 per kW. Nuclear power plants cost DM 4,000 per kW not counting the fuel.

Therefore, according to Wagner, his power plant supplies electricity from the environment but does not stress the environment with exhaust gases or obtrusive structures. Wagner's ships will be stationed about 4 km off the coast line.

Heinz Otto, an employee of the Blohm + Voss shipyard in Hamburg and in private life a member of the Working Group for Alternative Products has already petitioned the members of the Hanseatic Council regarding installing Wagner rotors "on the state-owned Neuwerk property." By such use, the "bad investment in Neuwerk" could be justified after the fact. Hamburg bought the island near the mouth of the Elbe 12 years ago from Lower Saxony in the false hope of being able to build a deep-water harbor there.

If things were to go according to Wagner's plan, 7 large ships each with 400-meter-long working rotors would be anchored off Neuwerk, and together would generate 700 MW. That would be almost as much as the costly Brunsbuette

nuclear power plant delivers. To determine whether or not such optimistic calculations are permissible and to be on the conservative side, the inventor would like to discuss them with scientists and have them checked by computer. For at the very least, installing such gigantic blades on a ship is a difficult task and costs lots of money.

Wagner's contacts at Schleswag still exhibit some skepticism, feeling that they have been exposed only to behavior relating to smooth operation at wind states between 4 and 9. "We would have to," they wrote Wagner concerning alternative-energy distribution firms, "demonstrate to our board of supervisors how you would assure your long-term delivery capability."

For Wagner himself there is no doubt. The inventor with a prophetic look at his cutter: "The design principle is simple and the physics is correct."

9160
CSO: 3102/437

BRITISH PLAN LARGE-SCALE USE OF FUEL CELLS BY END OF 80'S

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
12 Aug 82 p 7

[Article by TAR: "Can Fuel Cells Be Utilized Commercially in the Near Future?--The British Hope for Power Plants for Entire Communities; Prototype Plants in the United States and in Japan"]

[Text] Frankfurt, 11 August--Some time in late eighties the energy requirements of whole communities in Great Britain will be met by means of fuel cells--clean and without noise. This is the quintessence of a report on the state of the art of fuel cells, which the Energy Technology Support Unit (ETSU) of the British Government is working on. The report, which the British NEW SCIENTIST commented on briefly on 22 July, predicts that by the turn of the century, fuel cells of plants having a maximum output of 500 kilowatts could have the capacity to generate a total of 250 megawatts.

Fuel cells are by no means the newest achievement of technology. Sir William Grove was the first to describe the principle more than 140 years ago. The development work which began after World War II, was considerably intensified by the oil crisis. As a result, the capital requirements were reduced, and the limits of technology were pushed farther and farther.

As a source of power or heat, the fuel cells afford astounding opportunities. They work without generating noise or developing any fumes and can be operated with practically any fuel. Their efficiency can approach 80 percent, because the restrictions of mechanical aggregates do not apply. On principle, a fuel cell only requires very few moving parts. Its design is simple, maintenance is easy. An entire plant can be assembled from a number of cell components, and the plant, in turn, can be extended with increasing demand.

However, the problems should not be concealed. While the low-and medium-temperature cells operate between 0 and 150 or 150 and 250 degrees Celsius, the operating temperatures of the high-temperature cells working with cost-effective catalysts and direct reaction are 500 to 1,100 degrees Celcius. When reaching the upper temperature limit, the metals already glow in yellow heat. Therefore, their life and reliability are not quite satisfactory yet. In addition, the fuel cells require catalysts made of precious metals in order to operate without any problems. It is self-explanatory that these are rather

expensive. Only the high-temperature cells can do without precious-metal catalysts. In the United States, scientists and engineers have spent hundreds of millions of dollars to develop the technology. Most of the funds came from government agencies. However, large corporations, e.g., General Electric, Westinghouse, United Technologies and Engelhard Minerals have also advanced their projects at great expense. The U.S. researchers believe that their objective of approximately $500 per kilowatt is already quite close and that fuel cells will therefore be marketed around the mid-80's. The U.S. space shuttle "Columbia" is powered by fuel cells, for example.

Currently, prototype plants of 4.5 megawatts as a predecessor of fuel-cell power plants with an output of many hundred megawatts are under construction on Manhattan Island and near Tokyo. In Great Britain, however, neither the Central Electricity Generating Board nor the ETSU expect that large fuel-cell power plants will be used to ensure the power requirements of Great Britain in the forseeable future. The supply of electricity and/or heat to local supply systems, however, is well conceivable. The British John Matthey Co, which smelts precious metal, appears to have advanced the furthest with its preparations to take up production. As of next year, the company will commence the supply of small 500-W units. For the time being, the supply of the armed forces with a noiseless, emission-free power source for field use is contemplated. This could be a step in the direction of the more desirable production of combined heat and power sources of 50- to 250- kW output.

According to the ETSU's estimates, the British market will be at 100 million pounds sterling around the year 2000. Furthermore, this institution believes that 500,000 tons of coal worth 50 million pounds annually could be saved through a fuel-cell output of 2,500 megawatts, with the operation at a 75-percent capacity. Following a limited field test in the early 70's, more than 40 fuel-cell generators of a 40-kW output are operated in the United States to supply apartment blocks, warehouses and hospitals with power. Johnson Matthey is currently trying to get the British Ministry of Industry to provide 400,000 pounds for the installation of such a system in London.

According to the report, a hospital would be the ideal location for a combined heat/power supply system because its energy requirements are considerable, thus the fuel-cell plant could operate efficiently without generating operational noise or harmful substances in the exhaust gas. If the present technical and economical difficulties should be overcome, a potential of approximately 10 gigawatts of electrical and thermal energy can be expected from local fuel-cell installations in Great Britain.

9544
CSO: 3102/428

ENERGY

MBB COMPLETES ROTOR BLADES FOR GIANT SWEDISH WIND TURBINE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 18 Aug 82 p 5

[Article: "Bremen Rotor Blades for 'Aeolus'"]

[Text] Vereinigte Flugtechnische Werke GmbH, Bremen. One of the most remarkable structural components ever developed by the aeronautical industry has been fabricated at the Lemwerder factory of MBB/VFW. These components are two rotor blades for one of Europe's largest wind-energy installations which is presently being erected on Sweden's Gotland Island in the Baltic. Each of the blades for "Aeolus" is 35 meters long and has a maximum chord of 4 meters. The two blades plus the hub produce a rotor diameter of 75 meters. This gigantic drive element will be mounted on an 80-meter-tall tower on Gotland, according to company information.

The outstanding feature of this structure, according to VFW, is the fact that the metal shell is both the load-carrying structure and the aerodynamic contour. With this construction, subsequent maintenance work will be significantly eased since these parts are accessible for crack checks without disassembly. For assuring the structural integrity of the rotor blades, a fiber-optic crack sensor monitoring system developed and tested by MBB/VFW was built into the blade surfaces.

The development engineers and designers at MBB/VFW succeeded in designing and building the rotor blades for a useful life of more than 3 decades. During this period, they will execute more than 300 million cycles at temperatures between minus 40 and plus 55 degrees C. Also, they must be able to withstand what is known as the "century hurricane" which packs winds up to 220 km/h. Of the 8,760 hours in a year, the wind-energy installation will supply electricity for 6,000 hours and will deliver full power of 2,000 kW for 1,600 of these hours. Annual output will be 6.5 million kWh.

9160
CSO: 3102/438

NEW FUEL-OIL, COAL MIXTURE VERY STABLE

Paris L'INDUSTRIE DU PETROL GAZ-CHIMIE in French Jul-Aug 82 p 70

[Article: "Fuel-Oil Coal Dispersion: A BP Innovation"]

[Text] BP [British Petroleum] has perfected a new liquid fuel that it could market in 1985. A public test at the BP Dunkerque refinery allowed the French subsidiary of the group to demonstrate both the fuel and its combustion in a boiler. The proof has been given of the product's reliability. But what is it really all about?

In itself, the idea of a fuel-oil and coal mixture is not new. A patent was registered more than a century ago. However, it must be agreed that research was slowed down, then stopped, with the dazzling progress of petroleum. That lasted until the 1973 oil crisis. Fuel-oil supplanted coal in most electric power plants, in industrial facilities, and in home heating. Since then, things have changed. The price hikes for crude oil and, conversely, the profusion of coal reserves (four times greater than those of petroleum estimated at 82,625 GtOE) have led oil companies, and specifically the BP group, to undertake research to substitute coal for petroleum.

A Stable Product

The BP process produces a highly stable fuel-oil and coal dispersion that can supply existing facilities designed to be supplied by fuel oil. The fuel obtained is a mixture composed of 60 percent fuel-oil and 40 percent coal without any additives. The BP process avoids instability of the mixture by eliminating the phenomena of particles settling from the coal. Until now, the various mixtures developed suffer from the formation of a coal deposit that continuous agitation does not allow to be completely avoided. That is why a certain number of additives and surfactants, or "stabilizers," are often used. The major problem: decrease of the competitiveness of the product compared to fuel-oil, the competitor that is to be eliminated.

The BP fuel-oil and coal dispersion is obtained by a double crushing of the coal which brings the coal particles to a maximum size of less than 20 microns, which means that the new fuel does not need to be agitated. Tests have shown that it remained stable for 21 months in normal storage at various temperatures. Generally, the BP dispersion is stored at a temperature below 50°C and it can be pumped and handled at 60-70°C. The temperature

level to be reached in burner systems ranges between 130 and 160°C. Finally, the stability of the mixture remains intact during transporting, both in tank trucks and in trains or ships. We are told that the new fuel does not require extensive transformations in the area of storage facilities. Only some minor adaptations not requiring costly investments would be involved.

At the present time, BP has only made short-term tests because the production of the new fuel did not allow supplying of pilot units for 6 to 12 months. The tests performed have made it possible to draw several conclusions. Technically, the fuel oil-coal dispersion is judged viable. It is thought that boilers designed for the use of heavy fuel-oil can operate with a 100 percent efficiency using the new fuel. However, long-term tests should make it possible to identify problems such as corrosion, dust removal, and cinder formation on the superheater.

The latter problem is the result of the use of coal as such. Tests now under way should make it possible to determine which coals reduce cinder retention in the boiler.

Towards Marketing

In any case, the results obtained have been judged sufficiently promising for the group to begin marketing. At present, the fuel is produced at West Thurrock, Essex, in Great Britain. But BP is having a 100,000 t/year unit built, at West Thurrock also, which should go into service in August 1982. The total investment devoted to the entire fuel oil-coal dispersion project will then be 30 million pounds sterling.

The purpose of the fuel oil-coal dispersion is not to compete with coal. It is a substitute for heavy fuel oil. Its development has a double purpose: diversification of energy and cost reduction. In order for the new fuel to be competitive there must be a differential of $100 per tOE between the prices of fuel oil and coal. Which means that the fuel oil-coal dispersion is based on the hypothesis of a moderate increase in coal prices. In the opposite case, it could join the ranks of impossible products!

BP is planning to market in 1985 in the British, Belgian, Dutch and northern French markets. Marketing would require the construction of production plants at that time with a minimal capacity of 2 Mt/year in Europe, as well as in North America and in Japan.

9969
CSO: 3102/426

COAL BOARD SETS UP GASIFICATION COMMITTEE, FIVE-YEAR PROGRAM

Paris L'INDUSTRIE DU PETROLE GAS-CHIMIE in French Jul-Aug 82 pp 70-71

[Article: "Creation of a Gasification Committee at the Coal Board."]

[Text] A direction committee for gasification has just been set up within the [French] Coal Board for the purpose of:

--defining and proposing an ex situ gasification policy;

--monitoring the application of this policy as well as the study and execution of projects which result from it.

The committee will propose the operator for each project, as well as allocate the necessary means. The operator could be CDF [French Coal Board] Chemical, CERCHAR [French Coal Board Study and Research Center] or a [coal] field.

The following are members of the committee which is presided by Dubost, Director of Coal Industries for the French Coal Board:

--a representative of each of the fields involved;

--a representative of CDF-Chemical;

--the director of CERCHAR.

The existing gasification techniques, like those being developed, are poorly adapted to the gasification of secondary products of which there will be an excess in the French fields in the future.

Therefore, the Coal Board has decided to conduct, in association with GDF [French Gas Company] and EDF [French Electric Company], a program for the adaptation of an oxygen gasification technique for these products.

This program involves:

--preliminary tests at the pilot plants of the promoters of the new processes (Texaco, Wastinghouse, Institute of Gas Technology, Lurgi);

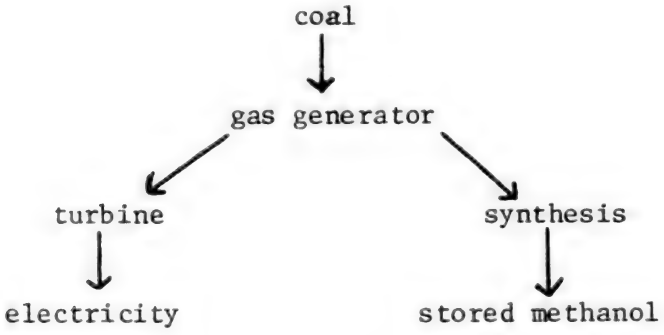
--choice of the most economically promising technique, taking into account the terms of the possible agreement with the process owner;

--the design, construction of a large industrial pilot (200 to 400 t/day), then tests and possible modifications.

This important program will extend over a minimum of 5 years.

Let us recall that, at the same time, the French Gas Company and the Coal Board group propose to construct industrial units for coals using processes currently tested. In cooperation with French Electricity Company, the Coal Board group is also studying new techniques for electricity production. The thinking of both the French Electricity Company and the French Gas Company results in the same conclusion: considering the structure of demand, the most economically viable way to consume coal is the use of gas turbines, with or without heat recovery, by a boiler feeding a steam turbine (depending on the planned length of use). The current method, 600 MW units, seems to be too costly in investments (especially if desulfurization of the smoke is required), and lacks flexibility, despite the technical miracles accomplished. These turbines would be supplied either directly with gas from the gas generator or by methanol, also from this gas produced from coal.

EDF and CDF have, therefore, decided to conduct jointly their economic studies of a mixed system:



The largest investment, the gas generator with its gas treatments, will be used on the basis of 8,000 hours per year. As seen above, it could transform by-products into more convenient energy carriers.

In addition, CDF is studying the construction of a 150 MW TAG-TAV [Gas Turbine-Steam Turbine] electricity unit supplied by a first- or second-generation gas generator.

9969
CSO: 3102/426

KRUPP TO EXPERIMENT WITH MATERIALS IN SPACE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
6 Aug 82 p 7

[Article: "Krupp To Investigate Material Properties in Space"]

[Text] Fried. Krupp GmbH, Essen. Krupp believes that 30 September 1983 can become an important date in the history of space research. On this day the first manned space flight with the space laboratory "Spacelab" will be launched. Since 1973 the FRG and nine other Europeans countries have participated financially in this laboratory which was developed through the joint effort of the American and European space agencies, NASA and ESA. The preparatory phase of the program," Technological Experiments Under Weightlessness" (TEXUS) has been underway since 1976. In this phase to date, there have been six unmanned rocket flights with experimental payloads which experienced microgravitational fields of less than .001 g during parabolic flights lasting about 6 minutes.

The Krupp Research Institute, Essen, is also participating in Spacelab utilization. At present, experiments from the field of materials technology are being readied which will be finished just in time for launching and will be sent into space as experiments aboard Spacelab. Information gathered from the tests will be of use later in developing new concepts in materials technology and in process and facilities technology under terrestial conditions.

Weightlessness is a phenomenon which can be realized on earth for only brief intervals during free fall. Therefore, due to the weightlessness which prevails there, experiments in space have the advantage that in liquids (inmelts) no gravitational segregation or thermal convection is present.

According to company information, the Krupp experiments include four technical fields: 1. The intermetallic manganese-bismuth compound is a magnetic material of high coercive field strength. Upon solidification of the melt under earth's gravity, the two materials separate forming MnBi seams on a primary manganese precipitate; thus, the alloy forms with difficulty. Under weightless ness on the other hand, a finer grain structure is formed with a greater MnBi fraction and better hard magnetic properties.

2. Mechanical properties of materials are largely determined by the type, quantity and distribution of inclusions. They contribute to both bad and good properties, for instance fracture failure a6d increased hardness (dispersion hardening). Also important is knowledge concerning the relation between the solidification process and the behavior of inclusions. A model system for studying this relation consists of finely powdered alumina suspended in molten copper. On earth, the system separates immediately due to the large d.fference in density between Al_2O_3 (alumina) and copper, but this is not the case under weightless ness, however. In this state under specific conditions one can determine the solidification speed at which the alumina particles cease being pushed away and start being incorporated into the growing copper crystals.

3. Metallic foams, which could be produced direclty from melts, would have in addition to good acoustic isolation properties also higher strength than those made by powder metallurgy. The high density difference between gas and metal appears to hinder the production of foams from melts. Experiments under weightless ness have shown, however, that the absence of surface elasticity in metal melts, especially steel melts, lowers foam stability. This, according to Krupp, leads to completely new process requirements for the production of metallic foams.

4. The heat conducting capability of metal melts can be determined only approximately under terrestial conditions since disturbances by convection cannot be avoided. This value is, however, very important for the design and operation of metallurgical facilities. For this reason, a compact measuring cell was developed for Spacelab which in the absence of convection permits very accurate measurement of the heat conducting capability of melts up to 600 degrees C, reports the Essen firm.

9160
CSO: 3102/430

BRIEFS

CERAMICS RESEARCH ACTIVITIES--Numerous ceramics are used as passive components: Capacitors, ferrites, protection elements of the thermistor of varistor types, piezoelectric ceramics, etc. The manufacture of these materials passes through various steps, the final properties only being produced after a sintering operation, involving thermal treatment as a function of time and under a controlled atmosphere. The mechanisms of sintering are not very well known, and the development of sintering depends on methods which ar still largely empirical. One of the tools permitting better definition of the sintering process is dilatometric analysis, which consists in establishing dilation-contraction curves as a function of the temperature. A study partially subsidized by the DGRST [General Delegation for Scientific and Technical Research] is in progress at the STQ department (CNET [National Center for Telecommunications Studies]-Lannion B). It consists in imposing on the ceramic not only a sintering cycle expressed conventionally in termsof a temperature-time cycle, but also a contraction-time cycle, this being done with a dilatometer developed at the laboratory and coupled to a computer which automatically controls the kiln and provides for acquisition and processing of data. The motivation is twofold: Better mastery and better comprehension of ceramic sintering mechanisms. The dilatometer, on which a patent application has been filed, is now operational. For traditional measurements as well as for controlled-rate sintering operations, the new dilatometer outperforms the commercially available equipment. The first controlled-rate sinterings were carried out in December 1981. Only two other laboratories have explored this route up to now: One at the University of Raleigh (United States), the other at Riso Laboratory (Denmark). [Text] [Issy-les-Moulineaux L'ECHO DES RECHERCHES in French Jul 82 p 61] 9828

AUTOMATED STEEL CROPPING--AEG-Telefunken, Frankfurt/Berlin. In order to be able to reduce the steel industry's conventional cropping allowance at the beginning and end of steel strips, AEG-Telefunken developed the cropping shape determination system, GEACUT. The contactless optical/electronic system utilizes the radiation from the material at rolling temperature and permits not only the recognition of the end shapes and a fully automatic shearing operation but also the determination of optimal cutting lengths, resulting--according to the firm--in higher productivity than before. In addition, the new acquisition system continuously determines the position of the optimal cutting line with respect to the shear axis, measures the speed, width and strip length of the rolled material, and displays the end shapes ona CRT. According to company information, the GEACUT system uses two diode line cameras whichdetect the surface of the rolled material in the rolling and transverse directions. From the two camera signals, the evaluation unit generates a picture of the strip's end shapes. In accordance with a predefined decision matrix, the positions of the optimal cutting lines as well as their distances from the ends of the strip are determined. These data re input to the shear control as position reference values for the cropping cut. The result is a fully automatic shearing operation. [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 10 Aug 82 p 5] 9160

CSO: 3102/430

BRIEFS

FRG RESEARCH MINISTRY REORGANIZES--A reorganization of several task areas of the Federal Ministry of Research has been announced by Minister Andreas von Buelow in Bonn. An independent new division has been established to accommodate the increasing importance of research and development in the area of rational energy use, especially the use of coal and the renewable energy sources. The advancement of biotechnology, medicine and environmental research will be brought together with research for humanization of the work place in a division restructured along disciplinary lines. Technical communications, microelectronics, manufacturing technology, information processing and innovation will be grouped with the objective of increasing support for these key technologies. An organizational unit shall concern itself with improving the transfer of research results to business, primarily in favor of small and medium-sized businesses, and continuously push for simplified subsidy and reporting procedures for these target groups. "With these measures, the organizational framework for redirecting research policy will be created," explained von Buelow as the objective of this reorganization. The organizational changes went into effect on 1 May 1982. [Essen ELEKTRO-ANZEIGER in German no 10, 1982 p 6] 9160

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REVIEW OF CIVIL AERONAUTICS RESEARCH IN SWEDEN

Stockholm TEKNIK I TIDEN in Swedish No 2, 1982 pp 8-9

[Article by Ulf Edlund and Anders Gustafsson]

[Excerpts] STU (National Board for Technical Development) has a new program for civil aeronautics research including investments of 5.8 million kronor in 1982/1983 and 6.5 million kronor in 1983/1984. The purpose of this program is to establish and maintain a level of expertise that will allow the Swedish civil aeronautics industry to cooperate with foreign aeronautics industries and participate as a partner, subcontractor, or principal contractor in commercially interesting civil aeronautics projects. One general goal is to guarantee the long-range development of expertise. In this article Ulf Edlund, Saab-Scania, and Anders Gustafsson, FFA (National Aeronautics Research Institute) describe civil aeronautics research in Sweden.

Reasons For Increased R&D Investments

The Swedish aeronautics industry's ambitious and single-minded investment in the civil aircraft market may be of great importance to Swedish employment and exports.

The aeronautics industry is investing heavily in aircraft development. For these industrial efforts to be successful, it is especially important that they receive support from goal-oriented research and development at research institutes and technical universities.

The new airplanes that will be developed to be sold in the future must be designed for a market with requirements that are quite different from those of today. This is true of the rapidly increasing fuel costs relative to other operational expenditures and of increased demands for environmental protection, comfort, and reliability.

At the same time, continuous technological development is underway in various fields such as aerodynamics, materials technology, engines, etc. increasing the potential for designing more efficient airplanes for the transportation market of the future.

Thus, in the future, we may assume that airplanes will be available with much higher fuel efficiency, safety, and comfort than the aircraft of today. Much progress has been made in recent decades. The research that is being done today forms the groundwork for the technology that will be applied in the airplanes of tomorrow.

Because of the fierce competition in the industry, new technology is introduced rapidly. The manufacturer who is most able to apply the new technology probably will be most successful. Thus, the challenge today is to study and further develop technological advances to the point that it will be possible to integrate them into the design of new airplanes.

How Profitable Is R&D?

It is difficult to quantify the profitability of research and development. In addition, it is difficult to demonstrate who profits from them: the manufacturer, the airline, or the traveler. In a market with strong competition, however, it is reasonable to assume that eventually everyone profits from technological improvements.

For the industry's ability to hold its own in heavy competition, however, it must be able to deliver an airplane that will be more profitable to the airline than a competing airplane. Both the total cost and the relationships among the various cost categories are of interest and are affected by the technological level of the airplane. Figure 6 illustrates the various components of the take-off weight of an airplane, how the airplane's price is related to the various systems, etc., and the various items included in the direct operating costs of the airplane. (The example applies to an airplane whose weight and operating costs are assumed to be constant during the depreciation period of the plane, but the relationship between various items may vary.)

Since fuel costs are a considerable percentage of the direct operating costs, even as shown in part C of the figure, it is easy to see that a higher initial price is permissible for an airplane with lower fuel consumption. Diagram A in the figure shows that reducing the structural weight and/or reducing the fuel load (due to lower consumption) makes it possible to increase the paying load. The relationships shown in the figure may be used to determine the profitability of technical improvements in the following manner:

If fuel consumption can be reduced by 1 percent and half the resulting decrease in fuel load can be converted to paying cargo, then the prototype costs may be allowed to increase by about 20 percent, thereby increasing the cost of the plane by about 4 percent.

If the structural weight of the plane can be reduced by 1 percent and half of this weight decrease can be converted to accommodate paying cargo, then prototype costs may be allowed to increase by about 35 percent.

For a large turboprop plane the prototype costs are on the order of 1.5 billion kronor. If the prototype costs are permitted to rise by 20 or 35 percent as indicated above, this would mean 300 and 500 million kronor, respectively, for a 1 percent decrease in fuel consumption or structural weight. These figures do not take into account the need for returns on the investment, the investment risk, etc., which naturally influence any decision in practice.

The examples indicate, however, that research and development and the resulting technological improvements can be extremely profitable.

Direction Of R&D Investments

Obviously, a small country such as Sweden cannot afford research and development of such magnitude that it would be foremost in all areas of aeronautics. It is just as obvious, however, that if the Swedish aeronautics industry is to compete on the international aircraft market, we cannot afford to ignore important areas of research and development.

Thus, to distribute and prioritize the available research and development resources in the best possible manner, it first is necessary to decide toward which goals (airplane classes, etc.) the research and development should be directed.

Then, based on these goals, it is important to identify vital areas of technology in which Swedish expertise presently is insufficient or totally lacking and begin building proficiency in these areas as soon as possible. In addition, of course, work must continue in areas where our present knowledge is satisfactory.

Because of the long periods of time that often pass between research and application of the results in a specific design project, research must be conducted continually even before concrete airplane projects are drawn up. It is too late to begin basic research just before the results are to be utilized. Thus, much of the research project always must be directed toward basic, general research.

A proposed program for work within certain areas during a 3-year period was developed in 1981 ("A Proposal for Civil Aircraft Technology Research at FFA and KTH 1981/82-1983/84"). When this proposal was developed, it was assumed that in certain areas civil aeronautics could learn from military aeronautics. It should be pointed out that the basic methodology often is the same for the development of civil and military aircraft.

Examples of important areas are presented below. At present, available resources do not permit research and development in all these areas.

Aerodynamics
- calculation methods and test technology;
- development of wing profiles and wings;
- elevator mechanisms;
- propeller slip effects.

Flight Mechanics, Stability, and Flight Characteristics

flight characteristics, simulation;
control system principles;
gust sensitivity, maneuverability.

Structure and Materials
weight reduction by using new materials, composite materials;
methods of calculation for structural analysis;
design solutions, production technology;
dimensioning philosophy, durability.

Noise and Vibrations
noise analysis;
vibration analysis;
cabin noise control

Safety
ergonomics;
flight safety;
crash safety;
design standards and certification.

Support Operations
air traffic control/procedural questions;
ground operations;
maintenance questions.

Engine Technology
engine characteristics;
combustion technology;
control technology;
materials technology;
construction technology.

R&D--Cooperation And Results

Close cooperation between the industry, on the one hand, and FFA and the technical universities, on the other, is vital if we are to achieve the proficiency and capacity necessary to strengthen the future competitive strength of the Swedish aeronautics industry. A research program such as the one described above, of sufficient magnitude, is an important element in this process. Researchers in the field of aeronautics and related disciplines should be trained in such a way that their goals and those of the research and development program coincide. Such cooperation is an important part of the long-range program to develop expertise. The results of the research program may be expressed in the following terms, which will be of vital significance to the Swedish aeronautics industry in its effort to develop and produce competitive civil aircraft.

Methodology in the form of advanced tools for designing and testing that may be utilized in current projects.

Basic data in the form of reports on the application of technology in given areas.

Proficient researchers and technicians whose research and development work in their respective areas has given them expertise that can be applied to current airplane projects and may be used to develop the technology required for future aircraft projects.

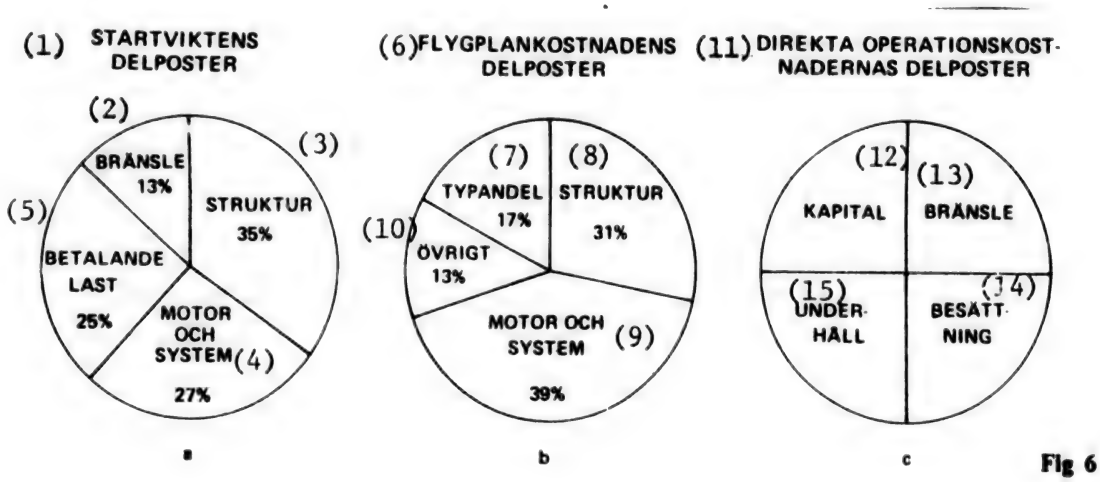

Fig 6

Key to figure:

1 Items included in take-off weight
2 Fuel
3 Structure
4 Motor and systems
5 Paying cargo
6 Items included in airplane cost
7 Prototype development
8 Structure
9 Motor and systems
10 Other
11 Items included in direct operating costs
12 Capital
13 Fuel
14 Crew
15 Maintenance

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: 3102/418

LP GAS GROWING IN POPULARITY AS AUTOMOBILE FUEL

Paris AFP SCIENCES in French 17 Jun 82 pp 39-40

[Text] LPG [liquefied petroleum gas] as an automotive fuel in France is now an accepted and competitive option to regular and premium gasolines and Diesel fuel.

LPG has finally come out of Limbo: 750 LPG refueling pumps have been installed in France. There will be 1,000 of them by the end of 1982, and 1,800 within 2 years. The difficult problem of filling up, which has heretore discouraged many automobile owners no longer exists. Every French city now has one or more LPG refueling pumps. The unrefueled cruising range of an LPG automobile is between 400 and 500 km.

The price of LPG--between 2.62 and 2.67 francs per liter--renders its use financially advantageous even though the consumption per 100 km exceeds that of premium gas for the same model of automobile.

As for performance, a series of tests organized by the GEPEL [expansion unknown] (Shell-BP) Company showed the qualities of LPG as an automotive fuel to be comparable to those of premium gasoline with, for added measure, less pollution and less noise.

There remains the problem and the cost of conversion of the vehicle to LPG. According to the oil companies, which are prepared to provide directory information and are training mechanics free of charge, the conversion must be done at a properly equipped shop. It is not a do-it-yourself job, on pain of ending up consuming excessive fuel. The cost of conversion runs between 3,500 and 5,000 francs, whereas a Diesel engine costs between 6,000 and 8,000 francs more than a gasoline engine.

The ideal would be for the automobile manufacturers to accept LPG without further hesitation and to offer models factory-designed to use it. But they remain distrustful and are offering only a few small commercial-type models. The initial cost differential of an automobile designed to use LPG can be amortized after the first 40,000-50,000 km, owing to the cheaper price of the LPG, and LPG automotive production is being addressed mainly to the high-

mileage users, who make up more than half their clientele, the other half being made up of national (PTT, EDF [French Electric Power Company]) and municipal administration vehicle fleets.

LPG makes it possible, however, for demanding motorists to keep a large-engined, comfortable-bodied car without lowering its performance; and a set of LPG equipment can be transfer-mounted from one car to another.

There is an inconvenience nonetheless: The public authorities have, for tax reasons, not authorized a mixed LPG-gasoline fuel. Furthermore, for reasons of safety, the presence of LPG refueling pumps along the highways is prohibited.

If the oil companies are so vigorously pressing the LPG drive, it is because the sale of petroleum gases (LPG is a mixture of 80 to 50 percent butane with 20 to 50 percent propane), by-products of the distillation of petroleum which were formerly flared,can represent a non-negligible revenue. Besides, petroleum gases are becoming more abundant at the refineries, since the development of nuclear energy is reducing the fraction of heavy industrial fuels in the distillation process and is concomitantly tending to increase the production of "white products" (gasolines), which supplies butane and propane in large quantities.

The oil companies are aiming to "Gepelize" 3 percent of the French automobile population, that is, between 450,000 and 600,000 automobiles: As many as in the Netherlands and less than in Italy at this time. For the time being, the French market (around 70,000 vehicles) has at its forefront GEPEL (Shell-BP) with 38 percent of all sales, followed by ELF-ANTARGAZ (25 percent), Total-Gaz (17 percent), PRIMAGAZ (14 percent) and various small companies.

The cost of an LPG pump, installed in a service station, comes to 200,000 francs, and if the oil companies are installing so many of them, it is probably because they believe in the future of gas as an automotive fuel.

9238
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BRIEFS

AIRBUS 310 TEST FLIGHTS--The first Airbus powered by General Electric CF6-80A1 jet engines completed its first flight Thursday at Toulouse. The flight of the plane, the third Airbus A-310 to come off the assembly line and the first to be produced to Lufthansa "standards" (specifications), lasted 5 hours, which were devoted essentially to measurements of performance and to systems tests. The plane flew at cruising altitudes of 25,000 and 35,000 feet. Tests were also conducted to verify that stall-test speeds are identical to those registered by the first two A-310's, which were equipped with Pratt and Whitney engines. Since the start of test flights on 3 April, the latter two planes have completed 103 take-offs and landings on test flights, accumulating close to 340 hours of flying time. According to Airbus Industrie, performance-test results "refute completely the arguments that have been advanced to the effect that both the operating range and the maximum flying altitude of the A-310 would be limited owing to the size of its wing." Airbus Industrie has already booked a total of 102 orders for the A-310, from 17 airline companies. Lufthansa, which has firm-ordered 25 planes, will put the A-310 into operation following certification in March 1983. [Text] [Paris LES ECHOS in French 9 Aug 82 p 8] 9238

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October 4, 1982

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